



PATENTS  
Attorney Docket No. SYMYX/008 DIV. CON

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PATENT APPLICATION

Examiner : To be Assigned  
Group Art Unit : To be Assigned  
Applicant : Yumin Liu  
Application No. : 10/719,441 Confirmation No.: TBA  
Filed : November 20, 2003  
For : NI CATALYSTS AND METHODS FOR ALKANE  
DEHYDROGENATION

New York, New York 10020  
March 11, 2004

Hon. Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450

INFORMATION DISCLOSURE STATEMENT

Sir:

Pursuant to 37 C.F.R. §§ 1.56 and 1.97,  
applicant, through his/her attorneys, makes of record the  
documents listed below.

Group A\*:

U.S. Patent Documents

3,502,737	Ghublikian	03/24/70
3,670,044	Drehman et al.	06/13/72
3,678,124	Stepanov et al.	07/18/72
3,832,205	Lowery	08/27/74
3,862,256	Isailingold et al.	01/21/75
4,070,413	Imai	01/24/78
4,115,441	Shaw et al.	09/19/78
4,176,140	Bertus et al.	11/27/79
4,180,690	Imai	12/25/79
4,250,346	Young et al.	02/10/81
4,251,394	Carter et al.	02/17/81
4,283,307	Barone et al.	08/11/81
4,296,607	Lawless	10/27/81
4,435,607	Imai	03/06/84
4,524,236	McCain	06/18/85
4,565,898	O'Hara et al.	01/21/86
4,568,790	McCain	02/04/86
4,613,715	Haskell	09/23/86
4,672,146	Abrevaya et al.	06/09/87
4,709,071	Sasaki et al.	11/24/87
4,788,371	Imai et al.	11/29/88
4,940,826	Font Freide et al.	07/10/90
4,996,387	Gerhold et al.	02/26/91

---

\* These references were cited by the applicant and the Examiner in the grandparent application - U.S. patent application No. 09/510,458, now U.S. Patent 6,417,422.

### U.S. Patent Documents

5,053,577	Teller et al.	10/01/91
5,094,990	Sasaki et al	03/10/92
5,132,269	Sasaki et al.	07/21/92
5,162,578	McCain, Jr. et el.	11/10/92
5,210,293	Kitson	05/05/93
5,219,816	Zhou et al.	06/15/93
5,376,613	Dellinger et al.	12/27/94
5,430,209	Agaskar et al.	07/04/95
5,439,859	Durante et al.	08/08/95
5,593,935	Golunski et al.	01/14/97
5,723,707	Heyse et al.	03/03/98
5,733,518	Durante et al.	03/31/98
5,759,946	Hoang et al.	06/02/98
5,780,700	Hagenmeyer et al.	07/14/98

### Foreign Patent Documents

EP 544 372 A1	EPO	06/02/93
EP 573 713 A1	EPO	12/15/93
EP 661 254 A2	EPO	07/05/95
WO 96/33149	PCT	10/24/96
WO 99/42404	PCT	08/26/99
WO 99/64160	PCT	12/16/99

### Other Documents

Baiker, Alfons, "Recent Developments in Heterogeneous Catalytic Oxidation for Fine Chemicals Synthesis," 5<sup>th</sup> International Symposium on Heterogeneous Catalysis and Fine Chemicals, Lyon, France, Aug. 30 - Sept. 3, 1999, PLI1.

Barrault, J., et al., "Selective Oxidation of Propane into Oxygenated Compounds over Promoted Nickel-molybdenum Catalysts," 3rd World Congress on Oxidation Catalysis, pp. 375-382.

Dalmon, et al., "Hydrogenolysis of  $C_2H_6$ ,  $C_3H_8$ , and  $n-C_4H_{10}$  over Silica-Supported Nickel-Copper Catalysts," Journal of Catalysis, 66, 214-221, (1980).

Ducarme, et al., "Low Temperature Oxidative Dehydrogenation of Ethane over Ni-based Catalysts", 23 Catalysis Letters 97-101 (1994).

Ducarme, V., et al., "Low Temperature Oxidative Dehydrogenation of Ethane Over New Catalysts Based on Group VIII Metals," Symposium on Heterogeneous Hydrocarbon Oxidation Presented before the Division of Petroleum Chemistry, Inc., 211th National Meeting, American Chemical Society, New Orleans, LA, March 24-29, 1996, pp. 153-156.

Ducarme, V., et al., "Oxidative Dehydrogenation of Ethane at Low Temperature Over Nickel Catalysts: Influence of Morphology and Chemical State of the Solid During Reaction," Studies in Surface Science and Catalysis, Vol. 107, 361-366.

Jalowiecki-Duhamel, L., et al., "Oxidative Dehydrogenation of Propane on  $CeNi_xO_y$  ( $0 \leq x \leq 1$ ) Mixed Oxides Hydrogen Acceptors," 3rd World Congress on Oxidation Catalysis, pp. 383-392.

Ji, Lang., et al., "Effect of Group VIII Elements on the Behavior of Li/CaO Catalyst in the Oxidative Dehydrogenation of Ethane," React. Kinet. Catal. Lett., Vol. 62, No.1, 121-128 (1997).

Juarez Lopez R., et al., "Oxidative Dehydrogenation of Ethane on Supported Vanadium-Containing Oxides," 124 Applied Catalysis A: General 281-96 (1995).

Lin, Manhua, et al., "Reaction Intermediates in the Selective Oxidation of Propane Over a Mixed Metal Oxide Catalyst," Proceedings ISO'99, Rimini (Italy), Sept. 10-11, 1999, G. Centi and S. Perahoner Ed., SCi Pub. 1999, pp. 143-144.

Liu, Yumin, et al., "High-Throughput Synthesis and Screening of Mixed Metal Oxides for Ethane Oxidative Dehydrogenation to Ethylene," 4th European Congress on

Catalysis, Rimini, Italy, September 5-10, 1999, Book of Abstracts, p. 41.

Liu, Yumin, et al., "High-Throughput Synthesis and Screening of V-Al-Nb and Cr-Al-Nb Oxide Libraries for Ethane Oxidative Dehydrogenation to Ethylene," Proceedings ISO'99, Rimini (Italy), Sept. 10-11, 1999, G. Centi and S. Perahoner. Ed., S*Ci* Pub. 1999, pp. 117-118.

Nazimek, D., "Influence of Added Copper on the Activity of Ni/Al<sub>2</sub>O<sub>3</sub> Catalysts in the Hydrogenolysis of n-Butane," *React. Kinet. Catal. Lett.*, Vol. 13, No. 4, 331-337 (1980).

Popova, et al., "Characterization of Nickel Loaded Mordenite Catalysts by Temperature Programmed Reduction," *React. Kinet. Catal. Lett.*, Vol. 39, No. 1, 27-32 (1989).

Richardson, J.T., et al., "Characterization and Deactivation of NiO-ThO<sub>2</sub> Catalysts," *Applied Catalysis*, 48, (1989) 159-176.

Schuurman, Y. et al., "Low Temperature Oxidative Dehydrogenation of Ethane over Catalyst Based on Group VIII Metals," 163 *Applied Catalysis A: General* 227-35 (1997).

Sinfelt, et al., "Catalytic Hydrogenolysis and Dehydration Over Copper-Nickel Alloys," *Journal of Catalysis*, 24, 283-296 (1972).

Thorsteinson, E. M. et al., "The Oxidative Dehydrogenation of Ethane over Catalyst Containing Mixed Oxide of Molybdenum and Vanadium," 52 *J. Catalysis* 116-32 (1978).

Zhang, Mingqian, et al., "Calcium-Nickel-Lithium Oxide: a High Selectivity Catalyst for the Oxidative Dehydrogenation of Ethane to Ethylene," *J. Chem. Soc., Chem. Commun.*, 1993, pp. 1480-1481.

Group B\*:

U.S. Patent Documents

3,901,828	Mai et al.	08/26/75
3,907,834	Milberger et al.	09/23/75
3,929,670	Kudo et al.	12/30/75
4,003,978	Shiraishi et al.	01/18/77
4,059,664	Nicolas et al.	11/22/77
4,374,758	Sasaki et al.	02/22/83
4,408,067	Nakamura et al.	10/04/83
4,418,007	Derrien	11/29/83
4,657,653	Bouet	04/14/87
4,717,694	Tamura et al.	01/05/88
4,769,357	Sarumar et al.	09/06/88
5,053,084	Masumoto et al.	10/01/91
5,086,032	Mazzocchia et al.	02/04/92
5,136,104	Saito et al.	08/04/92
5,380,692	Nakatsuji et al.	01/10/95
5,393,622	Nitta et al.	02/28/95
5,447,705	Petit et al.	09/05/95
6,156,695	Soled et al.	12/05/00
6,235,678	Mamedov et al.	05/22/01

The above references, groups A and B, were cited in both the parent and grandparent applications. Pursuant to 37 C.F.R. § 1.97(d), copies of these references are not enclosed in this Information Disclosure Statement.

---

\* These references were cited by the Examiner in the Office Action dated May 14, 2002 in parent application No. 09/849,378, which is a divisional application of U.S. patent application No. 09/510,458, now U.S. Patent No. 6,417,422.

Applicant respectfully requests that the above-cited documents be (1) fully considered by the Examiner during the course of the examination of this application and (2) printed on any patent issuing from this application. Applicant also requests that a copy of the enclosed Form PTO-1449 duly initialed by the Examiner be forwarded to the undersigned with the next communication.

This Statement is submitted more than three months from the application filing date, but before the mailing date of the first Office Action. In accordance with 37 C.F.R. § 1.97, submission of this Statement requires no fee. However, if for any reason a fee is due, the Director is hereby authorized to charge payment of any fees required in connection with this Information Disclosure Statement to Deposit Account No. 06-1075. A duplicate copy of this letter is transmitted herewith.

*Denise Bergin*

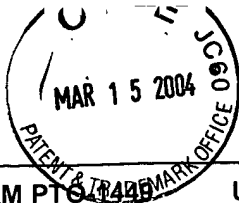
Pablo D. Hendler (Reg. No. 40,015)  
Denise Bergin (Reg. No. 50,581)  
Attorneys for Applicant  
FISH & NEAVE  
Customer No. 1473  
1251 Avenue of the Americas  
New York, New York 10020-1104  
Tel.: (212) 596-9000  
Fax: (212) 596-9090

I hereby certify that this  
Correspondence is being  
deposited with the U.S.  
Postal Service as First  
Class Mail in an envelope  
Addressed to:  
Commissioner for Patents  
P.O. Box 1  
Alexandria, VA 22313-1450 on

*3/11/04*

Claire J. Saintil-van Goodman

*[Signature]*  
Signature of Person Signing



<b>FORM PTO-1449</b> <b>U.S. DEPARTMENT OF COMMERCE</b> <b>PATENT AND TRADEMARK OFFICE</b>  <b>INFORMATION DISCLOSURE</b> <b>STATEMENT BY APPLICANT</b>	<b>ATTY. DOCKET NO.</b> SYMYX/008 DIV. CON	<b>APPLN. NO.</b> 10/719,441
	<b>APPLICANT</b> Yumin Liu	<b>CONFIRMATION NO. :</b>
	<b>FILING DATE</b> November 20, 2003	<b>GROUP</b>

**U.S. PATENT DOCUMENTS**

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	3,502,737	03/24/70	Ghublikian	260	669	
	3,670,044	06/13/72	Drehman et al.	260	683.3	
	3,678,124	07/18/72	Stepanov et al.	260	680	
	3,832,205	08/27/74	Lowery	106	288	
	3,862,256	01/21/75	Isailingold et al.	260	654	
	3,901,828	08/26/75	Mai et al.	252	462	
	3,907,834	09/23/75	Milberger et al.	260	346	
	3,929,670	12/30/75	Kudo et al.	252	455	
	4,003,978	01/18/77	Shiraishi et al.	423	237	
	4,059,664	11/22/77	Nicolas et al.	264	66	
	4,070,413	01/24/78	Imai	260	683.3	
	4,115,441	09/19/78	Shaw et al.	562	534	
	4,176,140	11/27/79	Bertus et al.	585	629	
	4,180,690	12/25/79	Imai	585	443	
	4,250,346	02/10/81	Young et al.	585	658	
	4,251,394	02/17/81	Carter et al.	252	452	
	4,283,307	08/11/81	Barone et al.	252	432	
	4,296,607	10/27/81	Lawless	62	6	
	4,374,758	02/22/83	Sasaki et al.	252	439	
	4,408,067	10/04/83	Nakamura et al.	560	215	
	4,418,007	11/29/83	Derrien	502	312	
	4,435,607	03/06/84	Imai	585	443	
	4,565,898	01/21/86	O'Hara et al.	585	441	
	4,568,790	02/04/86	McCain	585	658	
	4,613,715	09/23/86	Haskell	585	412	
	4,657,653	04/14/87	Bouet	204	290	

**EXAMINER****DATE CONSIDERED**

**EXAMINER:** Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not conformance and not considered. Include copy of this form with next communication to applicant.



<b>FORM PTO-1449</b>  <b>U.S. DEPARTMENT OF COMMERCE</b> <b>PATENT AND TRADEMARK OFFICE</b>  <b>INFORMATION DISCLOSURE</b> <b>STATEMENT BY APPLICANT</b>	<b>ATTY. DOCKET NO.</b> SYMYX/008 DIV. CON	<b>APPLN. NO.</b> 10/719,441
	<b>APPLICANT</b> Yumin Liu	<b>CONFIRMATION NO. :</b>
	<b>FILING DATE</b> November 20, 2003	<b>GROUP</b>

### U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	4,672,146	06/09/87	Abrevaya et al.	585	660	
	4,709,071	11/24/87	Sasaki et al.	558	322	
	4,717,694	01/05/88	Tamura et al.	501	135	
	4,769,357	09/06/88	Sarumar et al.	502	245	
	4,788,371	11/29/88	Imai et al.	585	443	
	4,940,826	07/10/90	Font Freide et al.	585	600	
	4,996,387	02/26/91	Gerhold et al.	585	654	
	5,053,084	10/01/91	Masumoto et al.	148	11.5	
	5,053,577	10/01/91	Teller et al.	585	500	
	5,086,032	02/04/92	Mazzocchia et al.	502	315	
	5,094,990	03/10/92	Sasaki et al.	502	214	
	5,136,104	08/04/92	Saito et al.	568	431	
	5,162,578	11/10/92	McCain, Jr., et al.	562	512.2	
	5,210,293	05/05/93	Kitson	562	512.2	
	5,219,816	06/15/93	Zhou et al.	502	223	
	5,376,613	12/27/94	Dellinger et al.	502	304	
	5,380,692	01/10/95	Nakatsuji et al.	502	303	
	5,393,622	02/28/95	Nitta et al.	429	223	
	5,430,209	07/04/95	Agaskar et al.			
	5,439,859	08/08/95	Durante et al.	502	66	
	5,447,705	09/05/95	Petit et al.	423	418.2	
	5,593,935	01/14/97	Golunski et al.	502	339	
	5,723,707	03/03/98	Heyse et al.	585	444	
	5,733,518	03/31/98	Durante et al.	423	248	
	5,759,946	06/02/98	Hoang et al.	502	303	
	5,780,700	07/14/98	Hagenmeyer et al.	585	617	

EXAMINER

DATE CONSIDERED

**EXAMINER:** Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not conformance and not considered. Include copy of this form with next communication to applicant.

FORM PTO-1449  U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE  INFORMATION DISCLOSURE STATEMENT BY APPLICANT	ATTY. DOCKET NO. SYMYX/008 DIV. CON	APPLN. NO. 10/719,441
	APPLICANT Yumin Liu	CONFIRMATION NO. :
	FILING DATE November 20, 2003	GROUP

## U.S. PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	NAME	CLASS	SUBCLASS	FILING DATE IF APPROPRIATE
	6,156,695	12/05/00	Soled et al.	502	305	
	6,235,678	05/22/01	Mamedov et al.	502	354	

## FOREIGN PATENT DOCUMENTS

EXAMINER INITIAL	DOCUMENT NUMBER	DATE	COUNTRY	CLASS	SUBCLASS	TRANSLATION	
						YES	NO
	EP 544 372 A1	06/02/93	EPO	B01J	27/19		
	EP 573 713 A1	12/15/93	EPO	C07C	253/26		
	EP 661 254 A2	07/05/95	EPO	C07C	5/48		
	WO 96/33149	10/24/96	PCT	C07C	5/327		
	WO 99/42404	08/26/99	PCT	C01G	51/00		
	WO 99/64160	12/16/99	PCT	B01L	3/02		

## OTHER DOCUMENTS (Including Author, Title, Date, Pertinent Pages, Etc.)

EXAMINER INITIAL	
---------------------	--

EXAMINER

DATE CONSIDERED

EXAMINER: Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not conformance and not considered. Include copy of this form with next communication to applicant.

<b>FORM PTO-1449</b>  <b>U.S. DEPARTMENT OF COMMERCE</b> <b>PATENT AND TRADEMARK OFFICE</b>  <b>INFORMATION DISCLOSURE</b> <b>STATEMENT BY APPLICANT</b>	<b>ATTY. DOCKET NO.</b> SYMYX/008 DIV. CON	<b>APPLN. NO.</b> 10/719,441
	<b>APPLICANT</b> Yumin Liu	<b>CONFIRMATION NO. :</b>
	<b>FILING DATE</b> November 20, 2003	<b>GROUP</b>

	Baiker, Alfons, "Recent Developments in Heterogeneous Catalytic Oxidation for Fine Chemicals Synthesis," 5th International Symposium on Heterogeneous Catalysis and Fine Chemicals, Lyon, France, Aug. 30 – Sept. 3, 1999, PLI1
	Barrault, J., et al., "Selective Oxidation of Propane into Oxygenated Compounds over Promoted Nickel-molybdenum Catalysts," 3rd World Congress on Oxidation Catalysis, pp. 375-382
	Dalmon, et al., "Hydrogenolysis of C <sub>2</sub> H <sub>6</sub> , C <sub>3</sub> H <sub>8</sub> , and n-C <sub>4</sub> H <sub>10</sub> over Silica-Supported Nickel-Copper Catalysts," Journal of Catalysis, <b>66</b> , 214-221, (1980)
	Ducarme, et al., "Low Temperature Oxidative Dehydrogenation of Ethane over Ni-based Catalysts", 23 <u>Catalysis Letters</u> 97-101 (1994)
	Ducarme, V., et al., "Low Temperature Oxidative Dehydrogenation of Ethane Over New Catalysts Based on Group VIII Metals," Symposium on Heterogeneous Hydrocarbon Oxidation Presented before the Division of Petroleum Chemistry, Inc., 211 <sup>th</sup> National Meeting, American Chemical Society, New Orleans, LA, March 24-29, 1996, pp. 153-156
	Ducarme, V., et al., "Oxidative Dehydrogenation of Ethane at Low Temperature Over Nickel Catalysts: Influence of Morphology and Chemical State of the Solid During Reaction," Studies in Surface Science and Catalysis, Vol. 107, 361-366
	Jalowiecki-Duhamel, L., et al., "Oxidative Dehydrogenation of Propane on CeNi <sub>x</sub> O <sub>y</sub> (0≤x≤1) Mixed Oxides Hydrogen Acceptors," 3rd World Congress on Oxidation Catalysis, pp. 383-392
	Ji, Lang., et al., "Effect of Group VIII Elements on the Behavior of Li/CaO Catalyst in the Oxidative Dehydrogenation of Ethane," React. Kinet. Catal. Lett., Vol. 62, No.1, 121-128 (1997)
	Juarez, Lopez R. et al., "Oxidative Dehydrogenation of Ethane on Supported Vanadium-Containing Oxides," 124 Applied Catalysis A: General 281-96 (1995)
	Lin, Manhua, et al., "Reaction Intermediates in the Selective Oxidation of Propane Over a Mixed Metal Oxide Catalyst," Proceedings ISO'99, Rimini (Italy), Sept. 10-11, 1999, G. Centi and S. Perahoner Ed., SCi Pub. 1999, pp. 143-144
	Liu, Yumin, et al., "High-Throughput Synthesis and Screening of Mixed Metal Oxides for Ethane Oxidative Dehydrogenation to Ethylene," 4th European Congress on Catalysis, Rimini, Italy, September 5-10, 1999, Book of Abstracts, p. 41
	Liu, Yumin, et al., "High-Throughput Synthesis and Screening of V-Al-Nb and Cr-Al-Nb Oxide Libraries for Ethane Oxidative Dehydrogenation to Ethylene," Proceedings ISO'99, Rimini (Italy), Sept. 10-11, 1999, G. Centi and S. Perahoner. Ed., SCi Pub. 1999, pp. 117-118
	Nazimek, D., "Influence of Added Copper on the Activity of Ni/Al <sub>2</sub> O <sub>3</sub> Catalysts in the Hydrogenolysis of n-Butane," React. Kinet. Catal. Lett., Vol. 13, No. 4, 331-337 (1980)

EXAMINER

DATE CONSIDERED

**EXAMINER:** Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not conformance and not considered. Include copy of this form with next communication to applicant.

<b>FORM PTO-1449</b>  <b>U.S. DEPARTMENT OF COMMERCE</b> <b>PATENT AND TRADEMARK OFFICE</b>  <b>INFORMATION DISCLOSURE</b> <b>STATEMENT BY APPLICANT</b>	<b>ATTY. DOCKET NO.</b> SYMYX/008 DIV. CON	<b>APPLN. NO.</b> 10/719,441
	<b>APPLICANT</b> Yumin Liu	<b>CONFIRMATION NO. :</b>
	<b>FILING DATE</b> November 20, 2003	<b>GROUP</b>

	Popova, et al., "Characterization of Nickel Loaded Mordenite Catalysts by Temperature Programmed Reduction," React. Kinet. Catal. Lett., Vol. 39, No. 1, 27-32 (1989)
	Richardson, J.T., et al., "Characterization and Deactivation of NiO-ThO <sub>2</sub> Catalysts," Applied Catalysis, 48, (1989) 159-176
	Schuurman, Y. et al., "Low Temperature Oxidative Dehydrogenation of Ethane over Catalyst Based on Group VIII Metals," 163 Applied Catalysis A: General 227-35 (1997)
	Sinfelt, et al., "Catalytic Hydrogenolysis and Dehydration Over Copper-Nickel Alloys," Journal of Catalysis, 24, 283-296 (1972)
	Thorsteinson, E. M. et al., The Oxidative Dehydrogenation of Ethane over Catalyst Containing Mixed Oxide of Molybdenum and Vanadium," 52 J. Catalysis 116-32 (1978)
	Zhang, Mingqian, et al., "Calcium-Nickel-Lithium Oxide: a High Selectivity Catalyst for the Oxidative Dehydrogenation of Ethane to Ethylene," J. Chem. Soc., Chem. Commun., 1993, pp. 1480-1481

EXAMINER

DATE CONSIDERED

**EXAMINER:** Initial if citation considered, whether or not citation is in conformance with MPEP 609; Draw line through citation if not conformance and not considered. Include copy of this form with next communication to applicant.